

Successful Methods

A Magazine of Construction Service

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No. 3

Hay-Wire Outfits

HAY-WIRE outfits—we have all seen them. Harness collars pulled together with a wire, engine springs wired down, broken hinges replaced with a wire, and a thousand other minor repairs made in a similar slipshod way. The worst of it all is that there is a lot of hay-wire point of view in the best of us. It is easier to make the most of some makeshift repair than it is to take a little more time and do it right.

Most folks also just some way naturally fail to realize the effect of hay-wire methods. Things seem to go along with the patchwork until a crisis comes. Then there is real trouble. The hay-wire lets go in places where its use in a hurry has long since been forgotten. A small break here and there ties up a machine. And very often one machine can slow up or even stop the whole outfit.

Right now is the time before work starts up to go over every piece of plant and equipment that is to be used this season. Get rid of all the hay-wire and other makeshift repairs. Have proper replacements made. Examine bearings, wearing parts and hidden parts. Make sure your outfit will start the season right. A few days spent on such work now may save weeks next summer and fall. And the best of outfits are not free from need of such attention.

How Big Are We?

SECRETARY HOOVER stated recently that five billions of dollars were spent in the United States on new construction in 1924. A national organization of architects put out a story last month to the effect that nearly five billions of new construction in 1925 was already on the architects' tables of the country. We have heard over and over that our highway program is on a billion dollar a year basis.

To most of us who have trouble raising enough to keep the old bus in gas and tires, these figures do not mean much. But it is worth while to try to realize that the 1925 construction program of the country will involve a total cost equal to one-sixth or more of the total value of all the steam railroads of the country. Some of us who are proud of the part—large or small—that we play in the construction business, like to feel that we are doing well our assignment in a program which is far too vast for the average individual to grasp.

Business in 1925

IN times such as these, business optimists always are popular with a majority of folks. Men who look on the risk of the situation usually are in the minority. Right now the fellow who takes to the middle of the road, with a lean toward the conservative side would seem to be playing safe.

Too many people follow the stock market as a band of sheep follow the bell wether. That "barometer" has indicated clearer and clearer business weather. No clouds have been in its range. Every prospect has been rosy. That's all fine, if true. But it pays to sit down and study fundamentals a bit.

No business swing has ever gone uninterruptedly in one direction. Right now we begin to see signs that the pendulum has gone pretty far on this swing. Interest rates—which are a good deal more sane as a barometer than the stock market—have hardened a bit. This means there is less money available for new business. Many commodity prices are at such heights that consumption is bound to be curtailed in the lines affected. Activity in the steel industry seems to have reached a peak.

We are not crying "Wolf, Wolf." We merely feel that 1925 is fortunately not going to be a boom year. It does appear that there will be plenty of business in most lines at fair margins of profit. But it is wise to have an eye to the windward and to keep some sail furled.

Our Cover Picture

THE picture on the cover of this month's issue of **SUCCESSFUL METHODS** shows the construction of the bridge over the Kissimmee River in Florida, built recently by the Florida Western & Northern Railroad.

"Successful Methods" Is Free

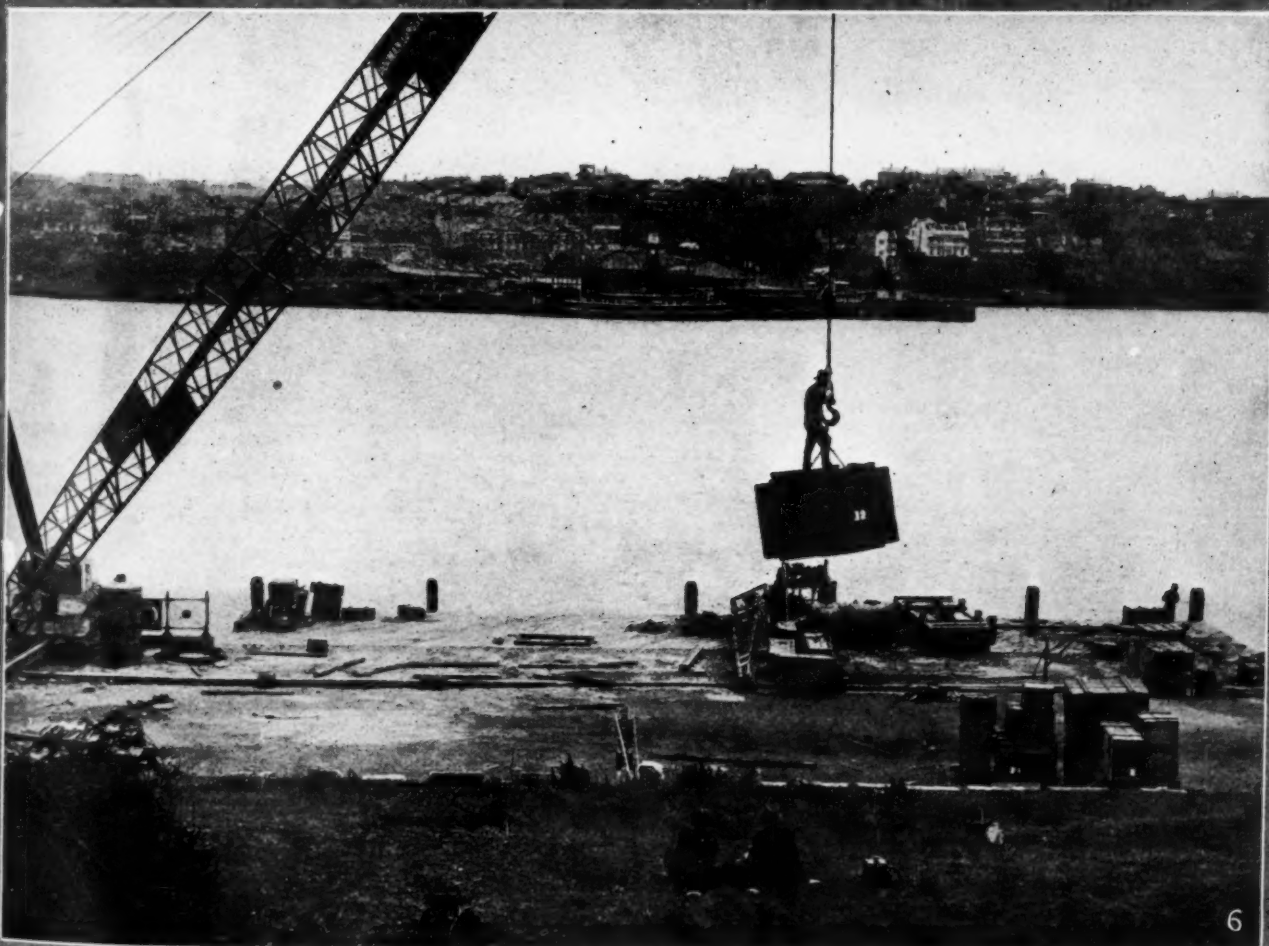
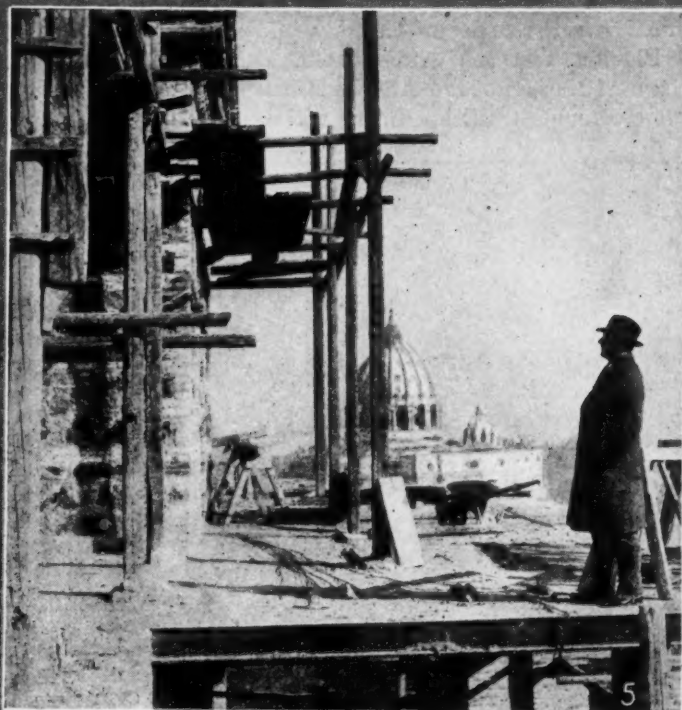
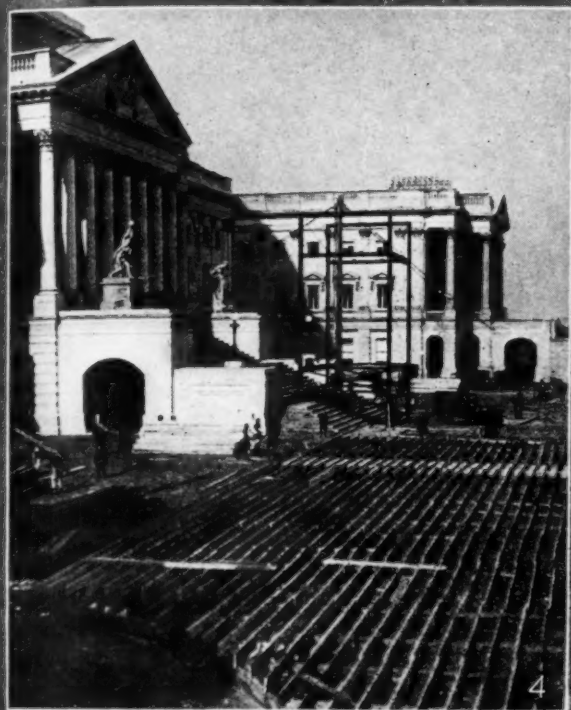
THIS magazine is sent free of charge each month to men engaged in the construction and material-handling fields. All requests to be put on the mailing list should contain a statement giving the character of work in which the applicant is engaged. Care also should be taken to write both name and address so clearly that no mistakes can be made. All applications to be placed on the mailing list will be considered carefully and we shall be glad to place qualified names on the mailing list to receive future issues.

Construction Jobs



1. Excavation work in a London fog. © Keystone.
2. Paris is preparing for its great exhibition of the decorative arts. One of the exposition buildings, with the Eiffel Tower in the background. © P & A Photos.
3. A drawbridge which has been built recently over the Danube in Vienna. The span was being put in position when this photograph was taken. © P & A Photos.

In Famous Places

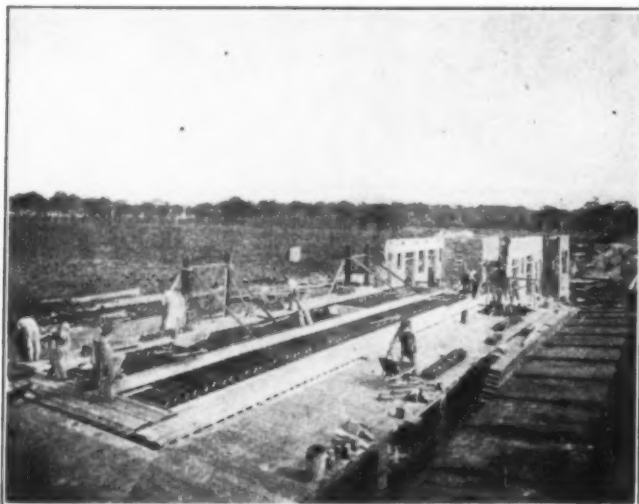


4. The builders have a share in the inauguration of President Coolidge. This photograph shows the work of putting up the stands on the east front of the capitol. © P & A Photos.
5. A great playground for children is being built in Rome with money raised in America. The photograph shows the grand stand under construction, with the dome of St. Peter's beyond. © P & A Photos.
6. One of the biggest bridges in the world. A single arch span which will cost more than \$20,000,000 is being built across Sydney Harbor, Australia. The photograph shows the first materials arriving on the job. © International

RAILWAY BUILDING IN FLORIDA

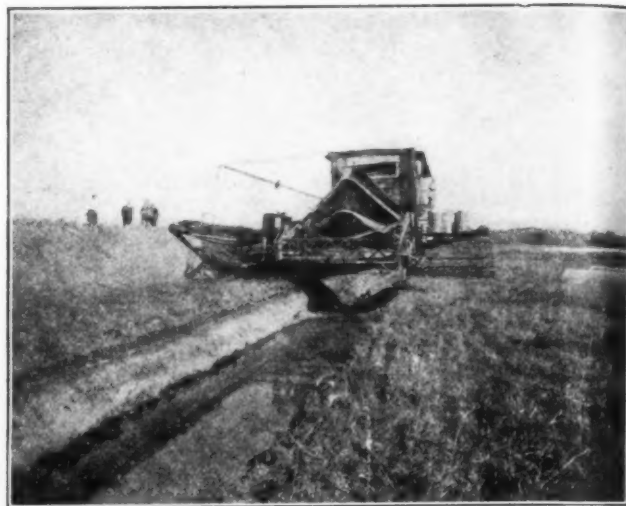
New Branch of Seaboard Constructed in Less Than a Year

SPEED is the order of the day in Florida, and the Florida Western & Northern Railroad, a subsidiary of the Seaboard Air Line, has lived up to the modern Florida tradition in the 205 miles of construc-



© International

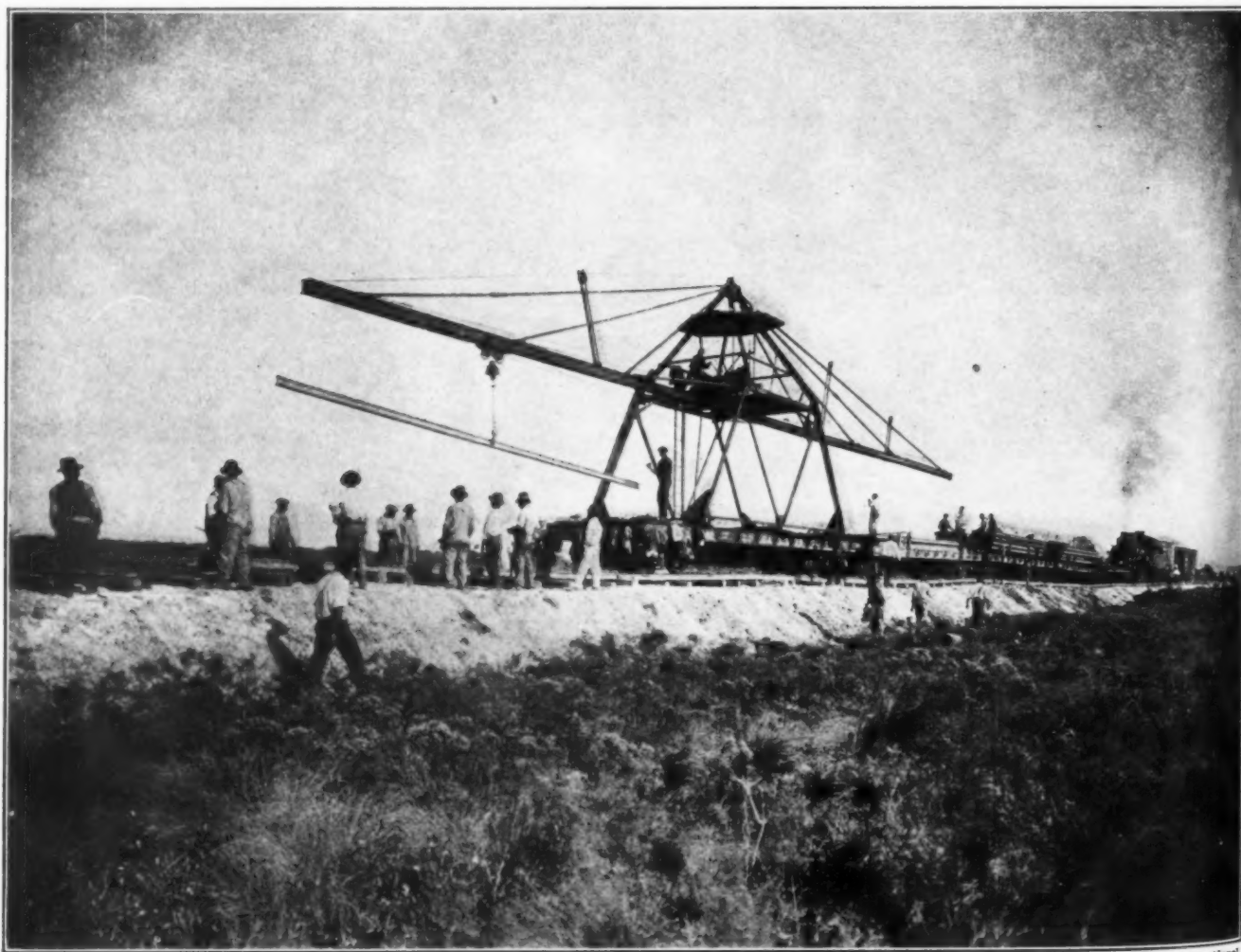
AT WORK ON PASSENGER STATION AT OKEECHOBEE CITY



© International

BIG DITCHER ON THE JOB

tion which have just been completed. This new trackage, which gives the Seaboard access to the east coast, with a station at West Palm Beach, was completed in about 10 months.



© International

TRACK LAYER THAT PUT DOWN ONE AND ONE-HALF MILES OF TRACK PER DAY



ONE OF THE CONSTRUCTION CAMPS

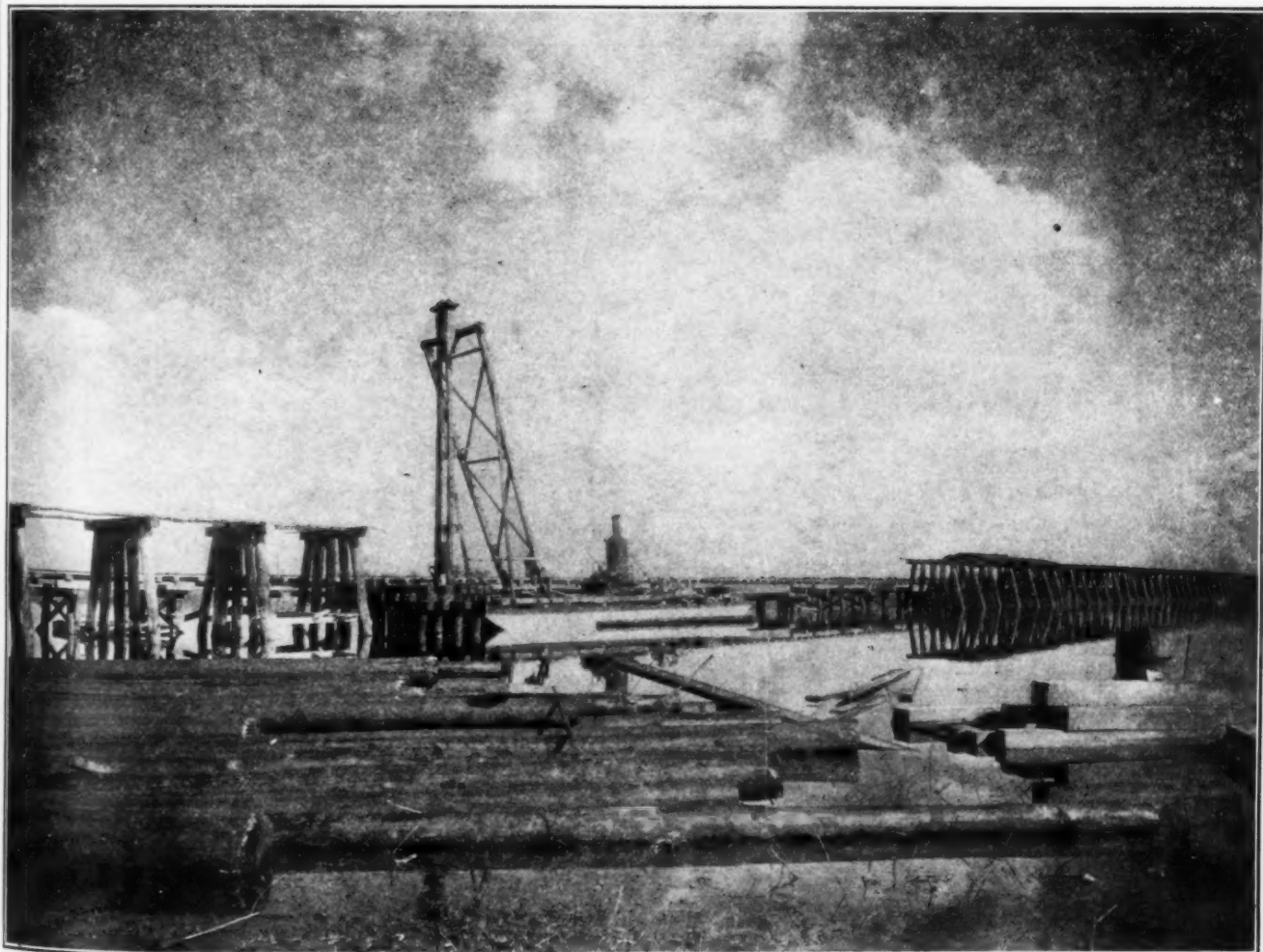
© International

The entire job was well organized and construction was pushed in order to open the new road during the present winter season. The opening ceremonies were held recently when several special trains from various parts of the country carried notable assemblages of railroad men and others over the new line.

The photographs accompanying this article show various phases of the work. In addition to the job of laying 205 miles of track over Florida's sandy soil,

several bridges had to be built and a number of stations were put up. One of the main bridges crosses the St. Lucie canal, the drainage canal which regulates the water of Lake Okeechobee. The railroad also crosses an arm of Lake Tulane on a trestle, and still another bridge carries it across the Kissimmee River.

The men working on the job were housed in well-arranged construction camps.



BUILDING THE KISSIMMEE RIVER BRIDGE

© International

SIGN LANGUAGE ON THE HIGHWAY

State Departments Constantly Working Out New Ideas for Direction and Protection of Travelers

THOSE who believe in signs have a remarkable variety to choose from along the highways of the United States. Unfortunately, the vast majority of the signs encountered have little or nothing to do with the road the traveler is on, but extol the virtues of various products which, in the opinion of their makers, are beneficial to society when sold at a proper price. The average traveler, however, is developing a keen sense of discrimination in signs and is training himself to ignore everything he sees except the signs placed there for his guidance by the State highway departments.

And the State highway departments are doing their level best to make it easy for the wayfarer to distinguish their signs. Most of the States have adopted

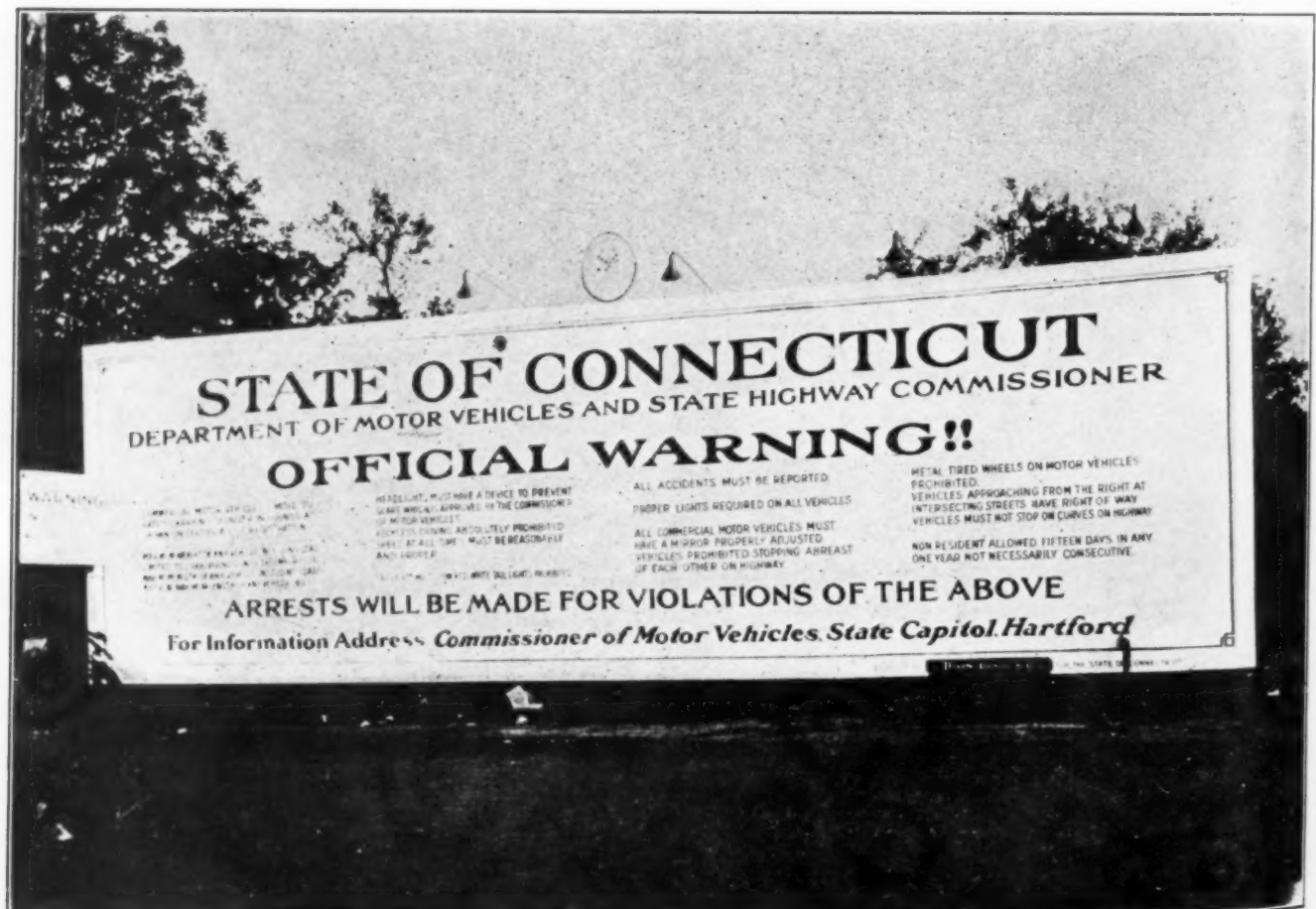


A WARNING SIGN THAT CANNOT BE IGNORED

devices of one sort or another which are easily recognizable as State signs, and once the motorist has accustomed himself to the system used in the particular State he is driving in, he experiences little difficulty.

There is little or no uniformity, however, in the systems used by the various States, and for the present this is probably a good thing. Each

State now has every opportunity to do all the experimenting it wishes, so far as marking its roads is concerned, which means that there are at least forty-eight highway departments which are concentrating on this problem. Ultimately it will be possible to sort out the good ideas from the bad, and gradually work out some uniform marking system which will be adopted by all the States and which will include the



MOTOR LAW INFORMATION AT THE STATE LINE

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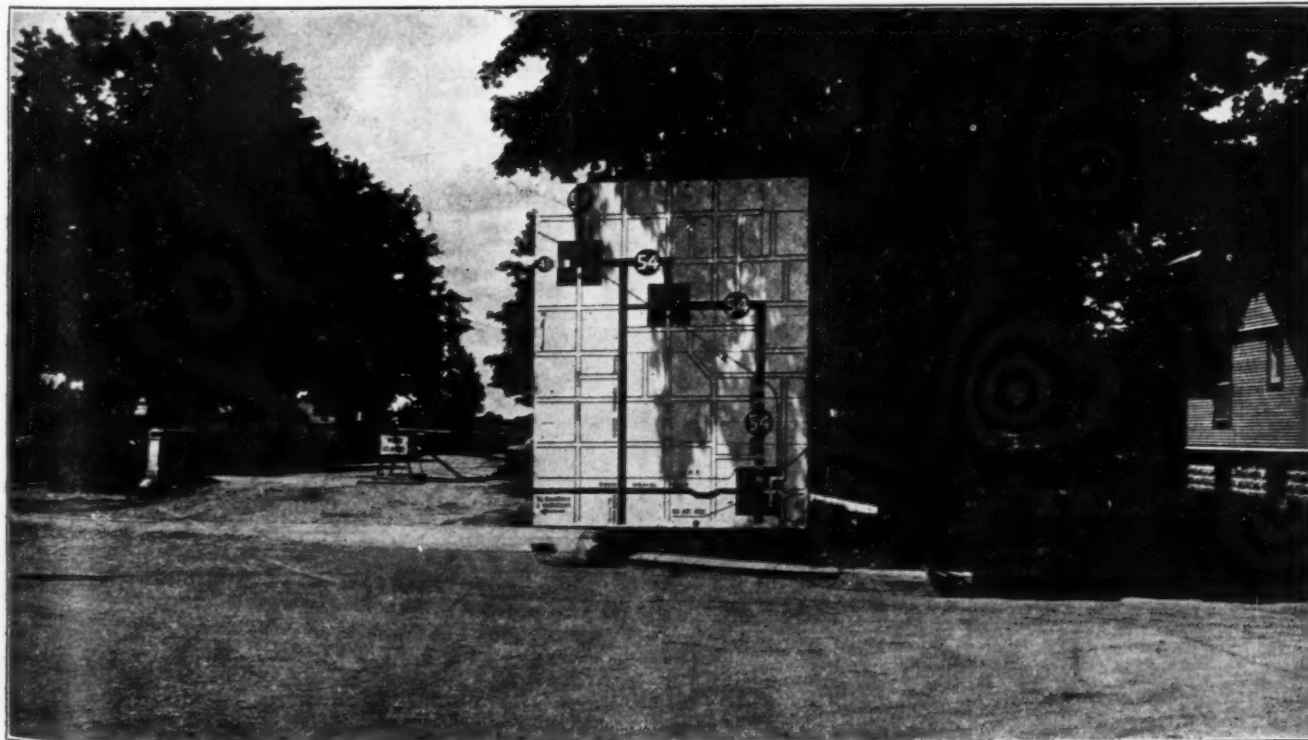


HOW ROADS ARE MARKED IN ENGLAND

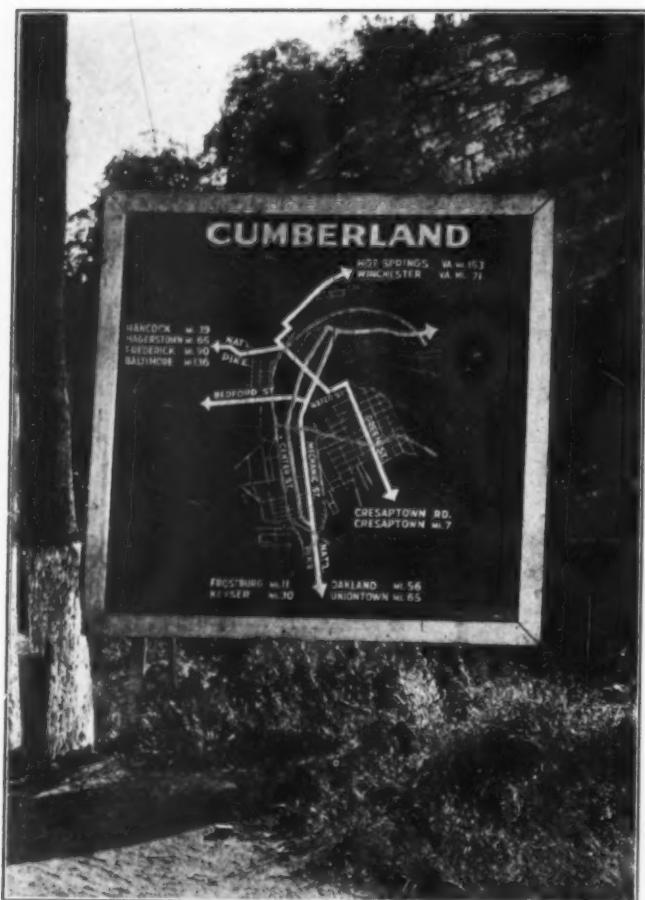
good features which are now being developed in different parts of the country. There is no hurry about that, however, and in the meantime the present systems are continually being improved from year to

year. Every season it becomes easier for the traveler to tell where he is, and what is just ahead of him.

His safety also is being insured by the proper marking of the highways. Many States are getting rid of



MAKING A DETOUR AS ATTRACTIVE AS POSSIBLE



A SOLUTION OF ONE PROBLEM THAT VEXES MOTORISTS

the unauthorized warning signs which have been set up in recent years and are substituting their own signs, which are judiciously placed and which do not mark a comparatively safe spot and leave unmarked a much more dangerous curve.

Accompanying this article are a few examples of what is being done to mark the highways in this country. Most of these photographs were taken by the United States Bureau of Public Roads. The big Connecticut sign shown at the bottom of page 6 is probably one of the best known highway signs in the United States. It is on the Boston Post Road at the New York-Connecticut line. It gives a digest of the salient features of the Connecticut motor law and leaves no valid excuses for ignorance of the provisions of that law.

Detours are always distressing to the motorist, but a detour sign such as that at the bottom of page 7 takes away much of the sting. This particular sign was put up at Sparta, Mich. At the top of page 7 is a typical sign at a British cross-roads which shows how the English are handling the marking problem.



Three States are represented by the photographs on page 8. The first is Maryland, and the picture shows a type of sign which that State has put up at the entrances to its principal cities. The place where



A TYPICAL STATE HIGHWAY ROUTE MARKER

the sign is is plainly marked, and the main route through the city are indicated. Illinois is represented by a typical sign bearing an outline of the State with the route number and a statement reminding the passerby that the road is built from the proceeds of automobile fees. The photograph at the bottom of the page shows a North Carolina grade crossing sign, where the law requires every motorist to come to a stop before crossing a railroad.

The job of marking the highways of the United States has been well begun and there is every indication that in the next few years real progress will be made.

TRACTORS KEEP WHEELS TURNING

Haul Elevating Graders and Wagons Through Heavy Going on Big Excavation Job in Chicago Park

THE main object of a landscape architect is to simulate nature as closely as possible, and for that reason a well laid out park when completed and opened to the public gives little evidence of the vast amount of work that has been done to get it into shape.

Under the direction of the South Park Commission of Chicago, Marquette Park is being remodeled and enlarged, and when it is finished the people who use the park will have little or no idea of the magnitude of the job that has been under way since the fall of 1923, and on which work will be resumed this spring as soon as the weather is favorable.

The J. J. McCaughey Company of Chicago has the contract for the job, which involves the moving of approximately 750,000 cu. yd. of material. Much of this material is being excavated in order to make a lagoon, which will be about 2½ miles in length and will vary in width from 70 to 200 ft. In addition, a golf course is being constructed and considerable grading work is necessary in that part of the project.

The main problem has been the excavation for the lagoon. The soil consists of a very heavy blue clay

which has to be excavated to an average depth of 12 ft. The clay in the lower 5 ft. has about the same consistency as hardpan. This clay is so heavy that blasting would be required in order to move it with a steam shovel, and the McCaughey Company, after making a thorough study of the situation, decided to handle the job with elevating graders loading wagons, both graders and wagons being hauled by 10-ton tractors. The photographs which accompany this article show the consistency of this clay.

The earth-moving plant has consisted most of the time of six elevating graders, a fleet of twelve tractors, about 20 6-yd. wagons equipped with wide tires, and 48 1½-yd. horse-drawn wagons.

Considerable seepage water encountered below the 2-ft. level has complicated the work and made the going extremely heavy. After considerable experimentation the contractors found that the heavy clay could be handled by two 6-yd. wagons, each drawn by a 10-ton tractor. This arrangement worked out much better than the use of smaller wagons drawn by horses. Although the load was a heavy one and the muddy footing increased the difficulties, the trac-



GRADER AND WAGONS PULLED THROUGH HEAVY GOING BY TEN-TON TRACTORS



THE CHARACTER OF THE STIFF CLAY EXCAVATED IS CLEARLY SHOWN IN THIS PHOTOGRAPH

tors stood up to the work. For six months of last year the equipment was kept working in two 9-hr. shifts, which, for the machines, meant 18 continuous hours of operation. In many cases the material had to be hauled up grades of from 6 to 10 per cent.

Since work began in 1923, approximately 600,000 cu. yd. of the heavy blue clay have been moved and at times the monthly total has been as high as 90,000

cu. yd. This monthly total has been reached frequently.

The horse-drawn wagons have handled the lighter jobs and the heavy work has been left to the motorized equipment, which has performed its work so efficiently that the contractors are well ahead of their schedule. There still remains about 150,000 cu. yd. to be excavated, and, as said before, work will begin this spring as soon as the ground is in condition.

LOUISIANA MAKES GOOD PROGRESS IN HIGHWAY CONSTRUCTION AND MAINTENANCE

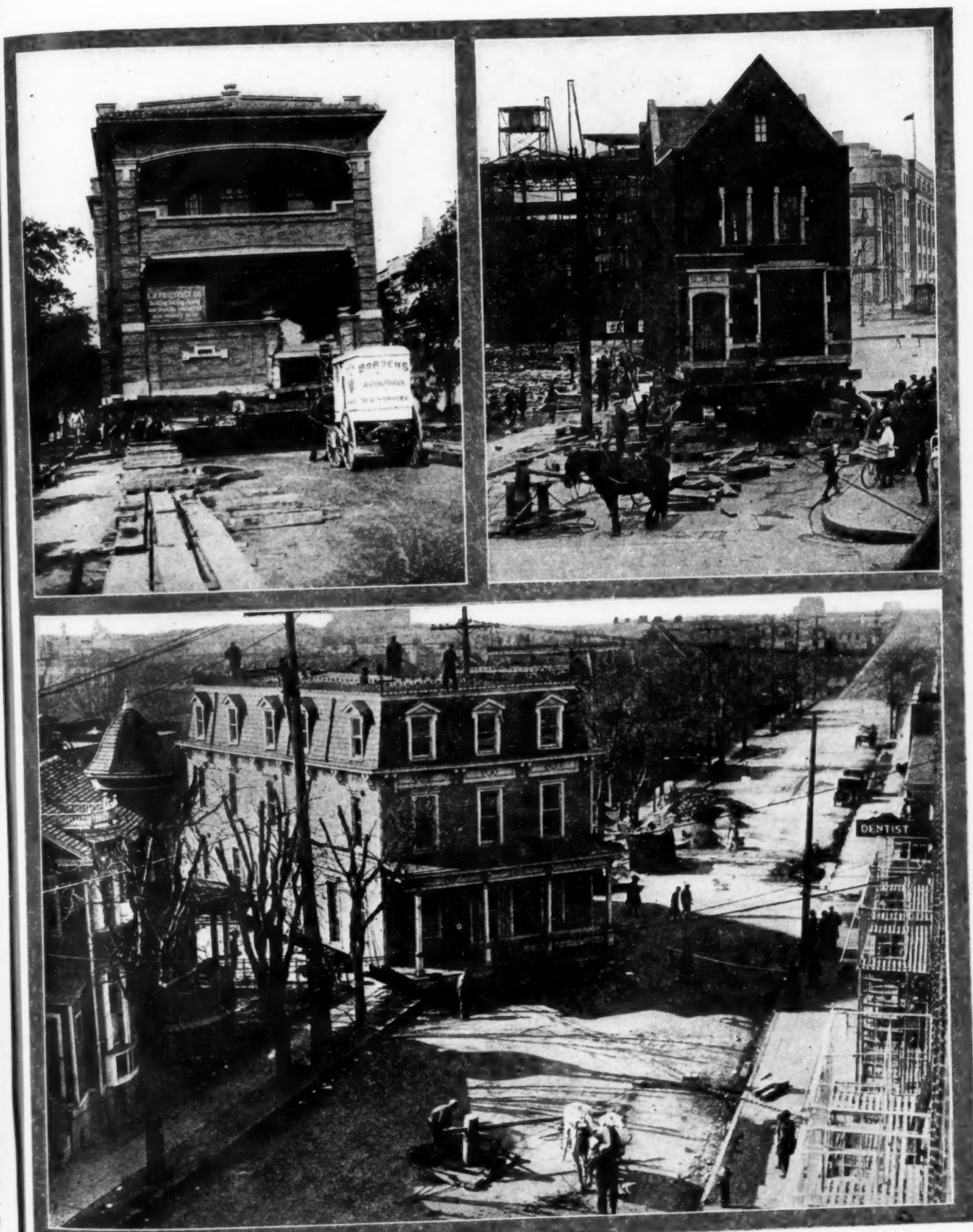
LOUISIANA is fortunate in being situated in a section of the country where highway work can be carried on throughout the year. For that reason it is hard to give accurate figures concerning the work completed during any calendar year, as there are always some projects still under construction.

W. B. Robert, State Highway Engineer, however, has recently issued a summary of the work done during 1924, which shows that the State spent approximately \$7,000,000 on construction work and built 700 miles of what Mr. Robert describes as "all-weather highways." This work includes the construction of a number of bridges, the most notable structure cross-

ing the Mermentau River at Mermentau. This bridge is a high 320-ft. fixed span with timber approaches. As the Mermentau River is navigable, the design had to be approved by the War Department.

During 1925 Louisiana expects to spend approximately \$8,000,000 for highway construction. During January bids were received on 10 projects and work is now going forward in many parts of the State. One project, known as the Monroe-Sicard highway, consists of a paved road 3.6 miles in length which will cost about \$145,000. At present, in addition to its construction work, the Louisiana Highway Department is maintaining approximately 3500 miles of highway.

Moving Day



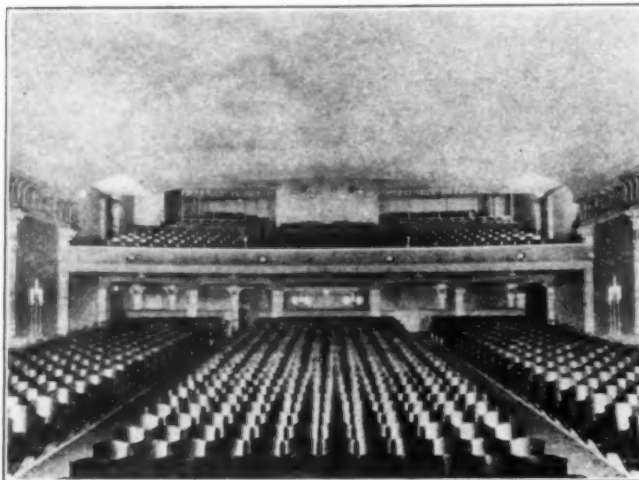
The upper left-hand photograph shows a two-story brick apartment building being pulled along a Chicago street with a milk wagon ready to make deliveries as soon as the house comes to a stop. © Underwood & Underwood
The other two photographs show house moving operations in Brooklyn. The method of moving buildings does not seem to undergo any change with the years, and despite the advent of the automobile in other lines of endeavor, horses are still the motive power. © P & A Photos

RECORD SPEED ON THEATER JOB

Gallery Poured in Fifteen Hours

FINISHING a job in fifteen hours which ordinarily would have taken the same number of workmen several weeks was the achievement of the Carlson Construction Company of Portland, Ore. The building on which the quick work was done was the Egyptian Theater, designed by Edward A. Miller, also of Portland. The entire theater was finished in 90 days, the work including the construction of five modern stores in connection with the main building, which is 126 by 145 ft. The construction crew, even at the busiest period of operations, never numbered more than 40 men.

In the building of the balcony the 15 hr. record was

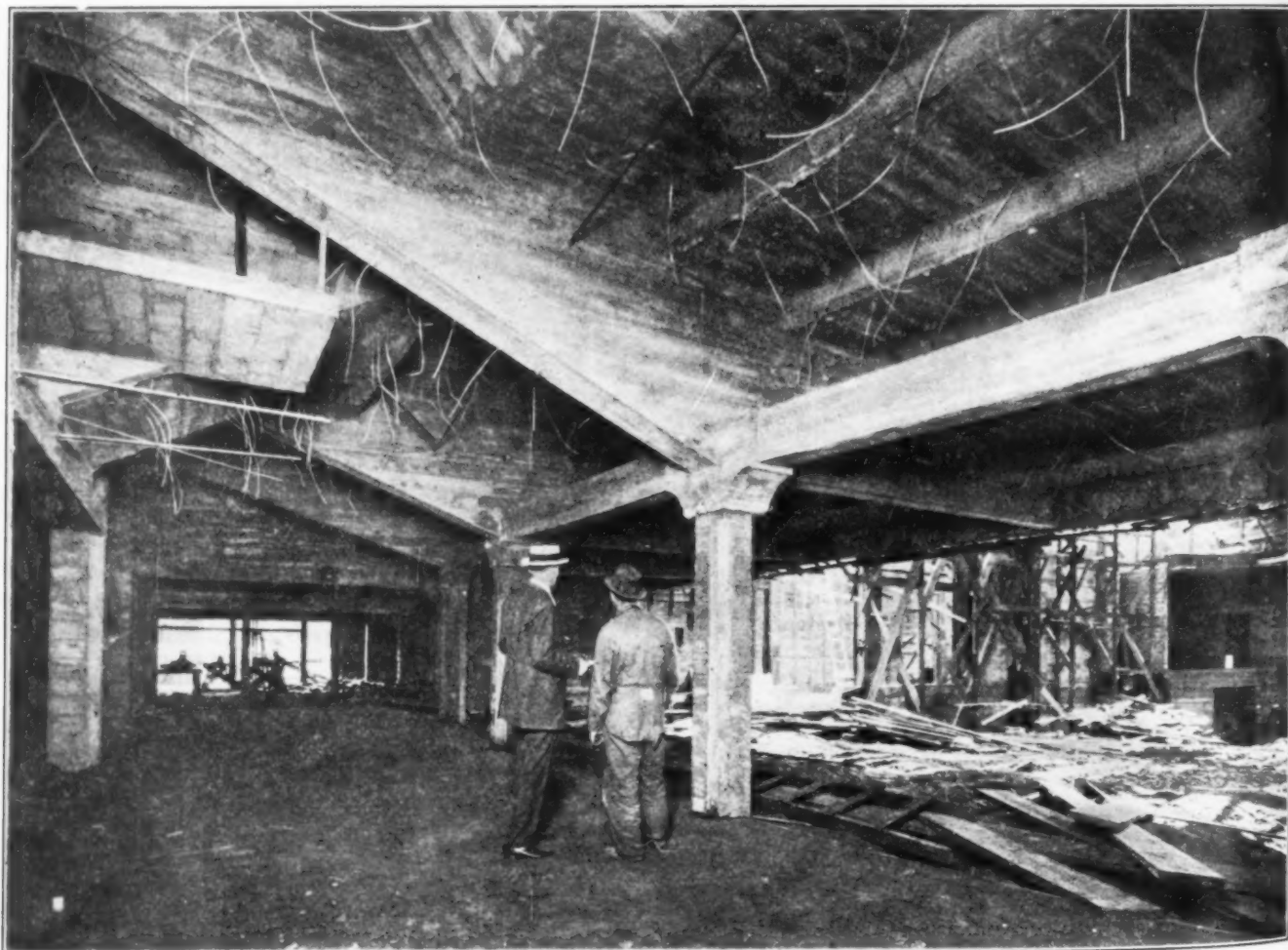


INTERIOR OF THEATRE. NOTE ABSENCE OF COLUMNS

made. The crew came on at 6 o'clock in the morning and by 9 o'clock the same evening the entire balcony was completed. The roof of the building was finished with equal speed, being started at 10.30 one morning and finished by noon the next day. In a day and a half 8800 sq. ft. of concrete were spread on the roof and the roof slab steel placed in position.

Under ordinary methods of roof construction, the contractors estimated, it would have

taken between three and four weeks to complete this work. Instead of using wooden forms hung from the trusses, steel joists self-centering with 2½-in slab were used, concrete being poured direct on the self-



UNDER THE GALLERY, SHOWING METHOD OF CONSTRUCTION

centering. This enabled the builders to lessen the dead load on the trusses, with the result that trusses, columns and footings were lightened and the suspended ceiling carried direct from the roof slab with heavy wire, looped through the self-centering supporting the light steel channels of the dome ceiling, leaving the work all ready for the lath crew to begin their operations as soon as the cement hardened.

The balcony is so constructed as to be approachable by an easy incline from the theater foyer. A decided

improvement over the usual type of balcony is introduced in the construction in the Egyptian, for its balcony is supported by four large reinforced cantilever beams. There is an overhang of 18 ft., which obviates the necessity of supporting columns, so annoying to the theater patron who has to take his seat behind them in many less modern theaters.

The speed with which the job was done made it possible to open the theater at the scheduled time, thereby making money for the owners.

FINISHING MACHINE ON STREET PAVING

IN the December, 1924, issue of SUCCESSFUL METHODS an article was printed describing the use of a mechanical finishing machine on city street work. The wheels of the finisher rested on the curbs, which were protected by steel plates. The picture which accompanies this article shows a finishing machine on a city



paving job tamping the concrete at a street intersection. This street is 24 ft. in width and the machine was adapted to strike off and tamp 5 in. below the top of the curb, the wheels traveling directly on the curb.

As shown in the photograph, a false form was laid at the intersection equal in height to the curb, and the machine operated over this false form, finishing the slab to the proper cross section and elevation. The corners of the intersection were finished by hand after the false form had been removed.

NORTH ATLANTIC OFFICIALS MEET

THE first annual convention of the Association of Highway Officials of the North Atlantic States was held at Haddon Hall, Atlantic City, N. J., Feb. 25, 26 and 27. The convention was attended by about 1000 men interested in road building. Big delegations from the New Jersey, New York and Delaware Highway Departments were on hand, and the Connecticut, New Hampshire, Massachusetts, Pennsylvania, Maine, Rhode Island and Maryland Highway Departments also were represented. A number of interesting papers were read and were thoroughly discussed at the va-

rious sessions. The officials of the new association are: Wm. G. Sloan, president; Paul D. Sargent, vice-president; A. Lee Grover, secretary and treasurer; directors, Paul D. Sargent, Maine; F. E. Everett, New Hampshire; J. A. MacDonald, Connecticut; A. W. Brandt, New York; Wm. G. Sloan, New Jersey, and C. D. Buck, Delaware.

AN ARKANSAS HIGHWAY BRIDGE

THE suspension bridge shown in the accompanying photograph is a good example of the type of bridge used to carry highways across streams in the South.



This particular bridge is in White County, Arkansas, and the cables support a 417½-ft. span. The bridge is one of a number constructed by J. N. Hammond of Bald Knob, Ark.

WYOMING MAINTENANCE COSTS

IN its recent report covering a two-year period, the State Highway Department of Wyoming shows that the cost of maintaining the State roads is about \$600,000 per year which being divided by the mileage under the charge of the department makes the cost of maintenance about \$220 per mile.

Wyoming is a State with only a small mileage of hard-surfaced roads and this maintenance figure is in the main based on the care of secondary roads. The work of maintenance is being constantly increased by Z. E. Severson, State Highway Engineer.

GEORGIA FLOODS COVER BRIDGES ACROSS OGEECHEE

State Highway Department Structure Unharmed—County Constructed Crossing Washed Away by High Water

By FRED M. GARNETT

THE unprecedented high water levels which covered Georgia's highways and bridges during January demonstrated the superiority of State Highway Department constructed bridges over county constructed bridges in many instances and gave additional strength to the theory that better bridges can be designed and constructed under

State Highway Department supervision than by county forces along crude and unskilled lines of endeavor.

It is generally known that Georgia has been recently subjected to very heavy rains of continued duration, especially in the central and southern part of the State, particularly at the watersheds of important streams. The principal rivers began to rise immediately and presented a very formidable appearance by overflowing their banks. One of Georgia's rivers which did quite a bit of damage was the Ogeechee River. This river is approximately 150 miles long; it rises near Augusta and empties into the



JENK'S BRIDGE OR WHAT WAS LEFT OF IT

Atlantic Ocean near Savannah. The high water of this river exceeded all previous records from 2.5 ft. to 3 ft. The last freshet of any consequence occurred in 1841 and was known as Harrison Freshet.

During the recent high water all bridges across the Ogeechee River were severely taxed, with the result that only the best constructed bridges

could withstand the fury of the swollen stream in its mad rush to the sea. In this connection a striking comparison was afforded between a well constructed bridge, built by the State Highway Department, and a poorly constructed bridge built by county forces, at two crossings over the Ogeechee River. In 1922 the State Highway Department constructed a 1200-ft. creosoted timber pile trestle bridge, and a small bridge 80 ft. in length for a relief opening. This bridge is located 2 miles south of Millen, Ga., on State Route No. 23. The causeway forming a part of this project was surfaced with 12-in. compacted sand clay and had



STATE BRIDGE COVERED WITH WATER. THIS STRUCTURE WAS FOUND UNHARMED WHEN WATER RECEDED



CAUSEWAY LEADING TO JENK'S BRIDGE AFTER WATER HAD WASHED DECKS FROM PILING

protecting guard posts over its entire length. These guard posts were of concrete and were spaced at intervals of 10 ft.

The embankment was entirely covered during the recent freshet, the previous high water mark being exceeded by 3 ft. on this project. The main bridge was covered to the top of the guard posts, and while the water hovered at this crest for several days, no part of the bridge floor could be seen. Traffic was held up for about a week. Heavy damage was anticipated to the main bridge, but when the water subsided no damage had been done. An immediate investigation showed that both bulkheads were intact. A peculiar benefit was derived from the water in cleaning the bituminous material which floored the deck. On account of the fill being comparatively new, it was cut in four places, but not until the water began to subside—a fact paradoxically at variance to general belief. With a force of 40 men, 6 teams and 4 trucks the road was placed in passable condition within three days' time.

The other important crossing over the Ogeechee River which was destroyed by the recent freshet is located 21 miles from Savannah, on State Route No. 26, between Bryan and Effingham County. The bridge spanning this stream was known as Jenk's Bridge, located on a primary system of highways, and which afforded a direct route to Macon and Atlanta. This bridge was 248 ft. long, but there were five other small lagoon bridges, the combined lengths of which were 550 ft. The causeway was 14 ft. wide and 1640 ft. long.

The bridge and causeway were built about eight years ago by county forces. While the timber in the bridges was of fair quality, being 85 per cent heart

cypress, still the work as a whole was improperly constructed. The piling was poorly driven and did not have sufficient penetration, as was evidenced from the recent failure of the bridge. While the recent high water was at its crest the bridges were completely submerged. The decks on all the bridges were washed from the piling. In a number of instances the piling was floated up with the bridge decks. The deck to the main bridge was washed 400 ft. downstream (when all piling in the channel became uprooted) and was completely destroyed. The fill approaches were practically undamaged, due to their age and the protection afforded by a good grade of clay.

A new bridge is already under construction by the State Highway Department, located 600 ft. upstream from the site of the old bridge. This bridge is rapidly nearing completion and will replace the old bridge. The new bridge was not damaged in any way by the recent freshet. It has been deemed inadvisable to repair the old bridge, as it would require at least thirty days with a large force to put same in passable condition. It has been estimated that it would cost at least \$5,000 for material and labor in repairing the old bridge. In this connection it was deemed more prudent to detour traffic and await completion of new bridge. This bridge will be completed within about sixty days.

The recent floods despite the great amount of damage done have at least demonstrated beyond the shadow of a doubt the wisdom of building good highway bridges. They have shown that structures designed by competent engineers and constructed under the direction of men skilled in such work will stand up where poorly designed and unskilfully built bridges will be swept away.

CARE OF EQUIPMENT SHOWS UP IN PROFITS

Expensive Machinery Demands Good Treatment

BY LION GARDINER

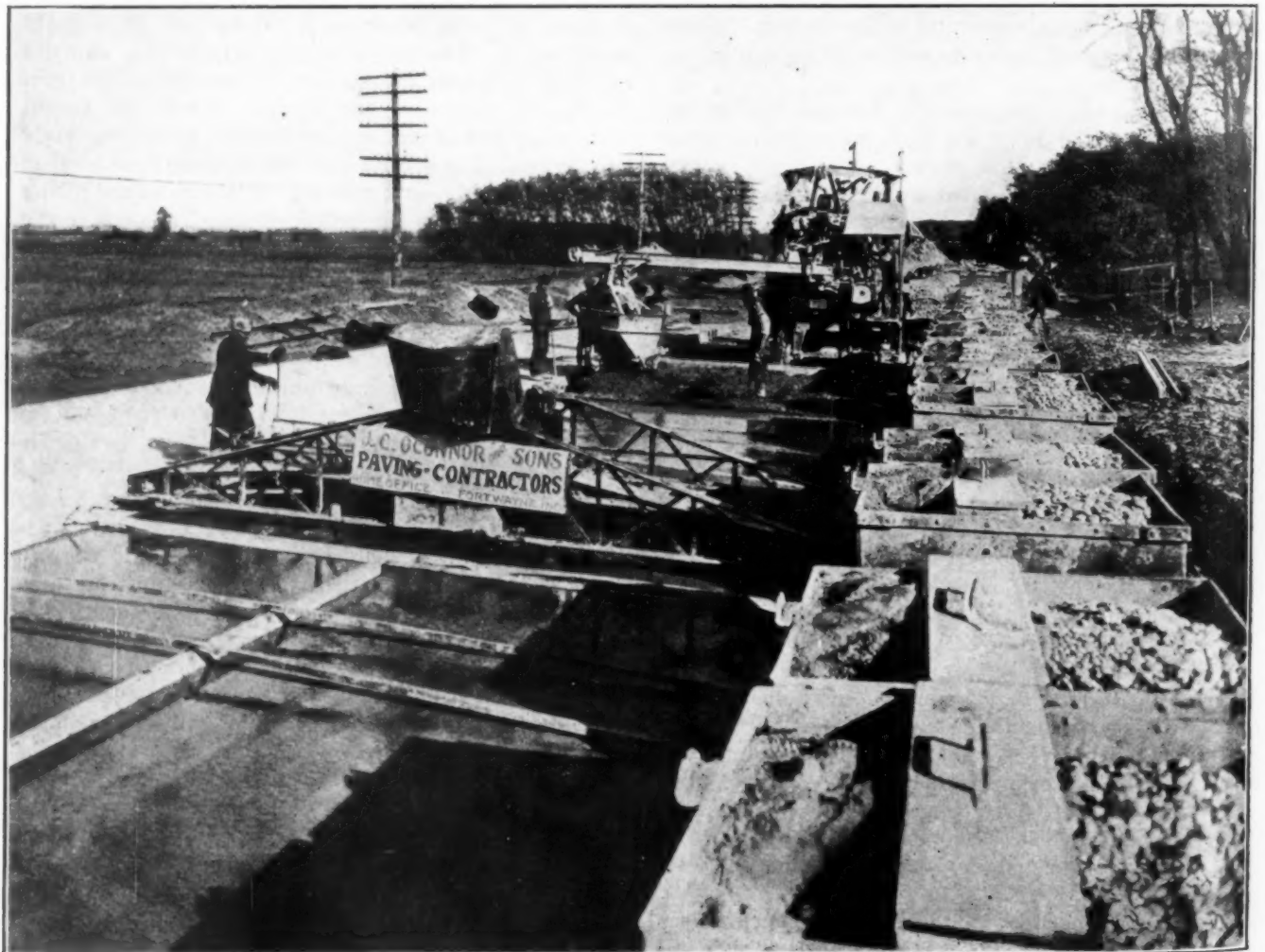
THE operating organization of every construction job is divided into two parts, the human and the mechanical. Both are equally important if low production costs are to be obtained. The most expensive machine cannot turn out good work in the hands of incompetent operators who have neither pride in their work nor understanding of the parts they are to play. And even the best superintendent in the world cannot get good production and low costs unless his equipment is in first-class shape and has the care to which it is entitled. The various machines on the job which comprise the mechanical organization are entitled to the same care, thought and study as the human organization, for without the former in good shape the latter cannot get continuous production.

The modern manufacturer and contractor are really co-partners in the construction field. The reliable manufacturers of the country spend thousands of dollars in experiments and research work testing new materials, and working with new ideas, with a view to turning over to the contractor for use in his work

machines which will do their job efficiently and at the lowest possible cost. When a manufacturer has turned out a good tool, his reputation is in the hands of his contractor-customer. For if it is not maintained in good mechanical condition it will not do its work, and then its failure will reflect on the manufacturer's reputation. It is a fifty-fifty responsibility, resting equally on manufacturer and owner.

No one has ever been able to figure the money lost through the breakdown of equipment on busy construction jobs, but it is certain that a large percentage of this loss can be saved through better care of equipment. One way to insure better care is to pay more money in order to get a first-class man as operator. Perhaps a nickel or more on the hourly rate paid the operator, or the hiring of a good master mechanic, whose sole job it is to inspect and keep the equipment in repair, will mean the difference between profit and loss at the end of the season.

Every contractor knows that some paving tools keep right on doing good work after 70 or 80 miles of road



PAVER, FINISHER, BATCH BOXES AND FORMS ARE ONLY PART OF A MODERN ROAD BUILDING PLANT

are finished, and others are ready for replacement at the end of the second season. The operator, and the man who is responsible for the upkeep, can make or break the best machine ever turned out.

Upkeep does not merely mean some oil splashed around the machine a couple of times a day. It means careful oiling and greasing. It means thorough cleaning at night, tightening of the bolts here and there, and a willingness to make minor adjustments before they become major repairs. It also means, and



A STEAM SHOVEL MUST BE KEPT IN GOOD CONDITION

this is important, the keeping on hand of certain spare parts which are most likely to go wrong, so as not to have to wait for factory shipment. A big paver standing idle because some part is on its way from the factory is one of the real tragedies of the road-building game.

A good example of what a contractor can do to keep his equipment in good shape has been furnished by the Wm. C. Meneely Company of Decatur, Ill., the organization which made such an excellent record last season. It is a self-evident fact that this record could not have been made unless Mr. Meneely's equipment was working day in and day out whenever the weather permitted. A few days of idleness for some of his bigger units would have spoiled all chances for a record. One reason why his machines were kept in shape is found in the following notice which was placed at various points on the job:

BULLETIN

Notice—To all Operators of Machinery, viz.: Tractors, Pumps, Rollers, Mixers, Finishing Machines, Cranes, Steam Shovels, Locomotives, Trucks, and other machines:

STARTING JUNE 1, 1924,

The Company offers a prize of \$5 each pay to the operator or man who, during the preceding two weeks, has kept his particular piece of machinery; in other words, the machine he has been operating:

Cleanest—Meaning removing from the machine all mud and dirt, cement, grease and any other foreign matter.

Best Oiled—Which means that the machine has been kept oiled in a manner to facilitate its being in the best running condition.

Best Greased—Meaning that the proper amount of grease has been applied to and each vital part of the machine looked after intelligently every day.

Breakdowns and Repairs—In awarding the prize the judges will take into consideration as the most important factors, the delay caused by breakdowns and money spent for repairs.

The master mechanic will keep a record of all delays and time that machines are out of commission, which will be taken into consideration in awarding the prize.

The appearance and placing of tools and other equipment on the machine will also be considered.

An allowance will be made for the difference in the duty, the location and condition under which the various machines are working.

In cleaning machine, each man is to furnish his own equipment for this purpose, except that the company will furnish him with a small bunch of waste and gasoline. The company will furnish paint where it is necessary or needed to improve the appearance of the machine. The company will not pay a man for cleaning, oiling and greasing his machine. However, should there be any delays in the day's work, the operator will be working on keeping his machine clean and in good running order. For instance, should the mixer stop for any reason for a few minutes, or a short time, truck drivers and motor drivers should at once begin to clean their machine. Any spare time an operator has, caused by delays of any sort, should be utilized by spending it on improving his machine in every way possible. The prize is being offered as an incentive toward this goal. This is more or less of a safety first contest and any accident to the machine or accident to a man by him being hurt or crippled will be taken into consideration in the awarding of the prize.

JUDGES

The judges of this contest will be:

Superintendent.
Mechanic.
Const. Engineer.
Timekeeper.

..... (Contractor).

Mr. Meneely testifies that this plan worked. In a letter received from him, he says:

"The first two weeks our machinery looked as if it



THIS SORT OF EQUIPMENT ALSO DESERVES CARE

had been overhauled and it was kept looking practically new the rest of the season. This bulletin was issued June 1. I will give you one illustration. We had an Erie steam crane that had not been cleaned and greased good for two years. After this bulletin came out the operator and the fireman certainly made this crane look like new and won the first prize. You

can see that we had five different men on as judges, so that there can be no partiality shown. This has been the most effective method we have found to keep the machinery in shape. Cleaning and oiling is the life of the machinery. We have found that when we

are able to get the men to keep the machines cleaned and oiled the need for repairs is eliminated to practically the last degree. This season caused the men to become very much interested and the result was wonderful."

VOLCANIC ASH FOR ROAD SURFACING

Nicaragua Possesses Excellent Material Not Available in Other Parts of World

ROAD construction in Nicaragua presents problems that are in many ways even more serious than those that have to be solved in this country. On the other hand, the building of roads in an undeveloped country like Nicaragua offers opportunities for local development beyond anything that seems possible in the United States. There also are various favorable physical conditions which do not exist here, notably the absence of frost.

The accompanying photograph shows a short strip of road that has recently been completed from Managua, the capital of the country, toward Matagalpa, in the coffee region in the northern part of Nicaragua. This road is, eventually, to be about 90 miles in length. It will open up to the outside world for all the year traffic a very large coffee growing section, which is now practically without highway transportation facilities.

The stretch of road shown in the photograph is located about 2 miles north of the town of Tipitapa, which is on the outlet of Lake Managua to Lake Nica-

ragua. In this vicinity the country is very flat and quite swampy in places. Underlying the surface at a depth of 12 ft., however, is found a volcanic ash containing larger particles. This material sets up excellently when used as a surfacing. By raising the grade above the ground water level and then surfacing it with 8 in. of the volcanic ash a very satisfactory road has been provided at all seasons of the year.

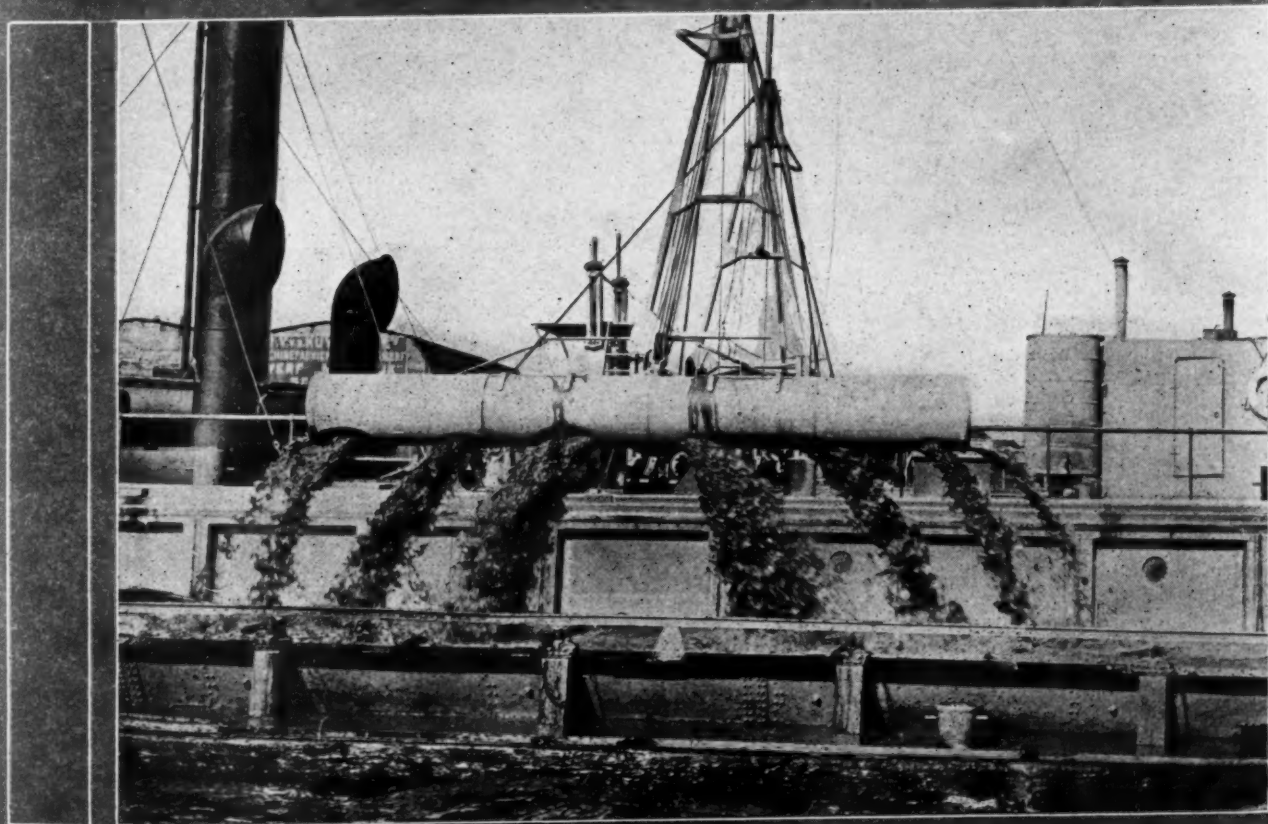
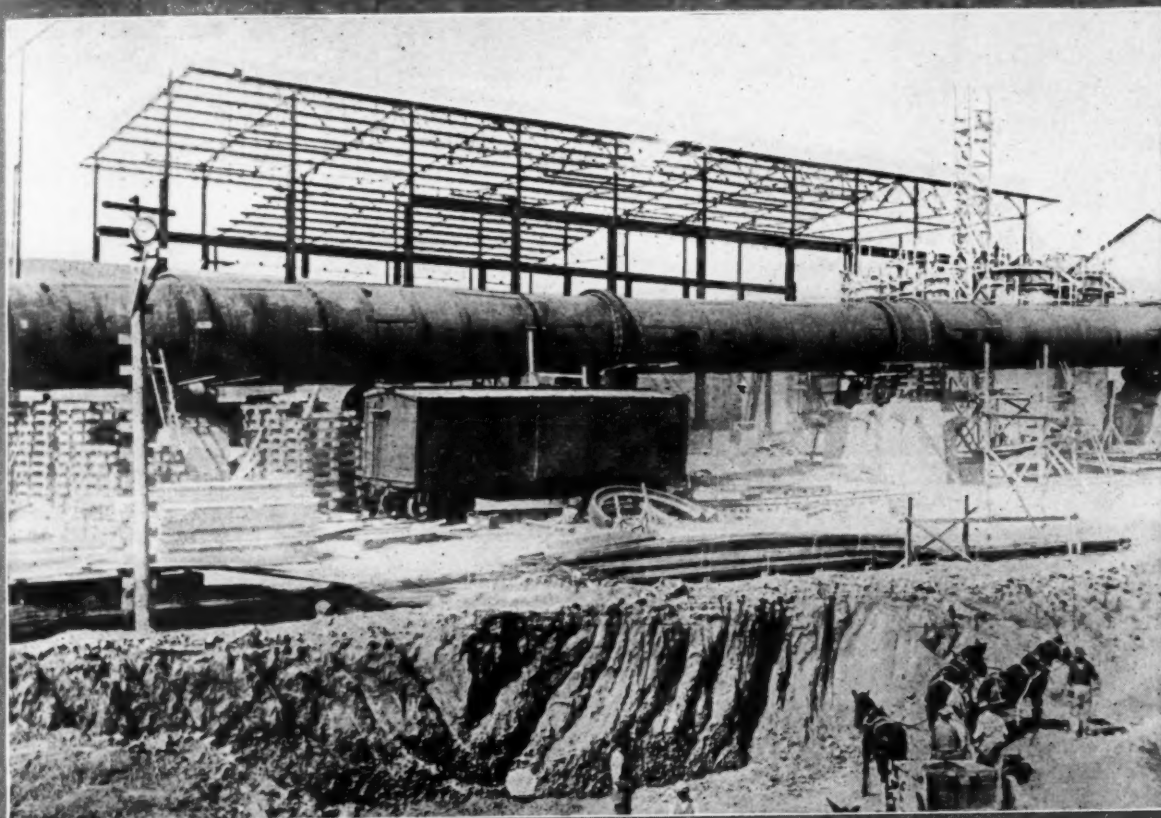
Approximately 20 miles of this highway have been completed. This is comprised of three sections in the worst part of the swampy country. These sections are now usable at all seasons of the year, whereas prior to their construction it was possible to haul loads only during the dry season.

The road was built under the direction of Adolfo Cardenas, Nicaraguan member of the Pan-American Highway Commission, which visited the United States in June, 1924, and who is now General Manager of the Nicaraguan General Railroads. Mr. Cardenas appears at the left in the photograph.



AT WORK ON NEW ROAD IN NICARAGUA

A Pair of Big Cylinders



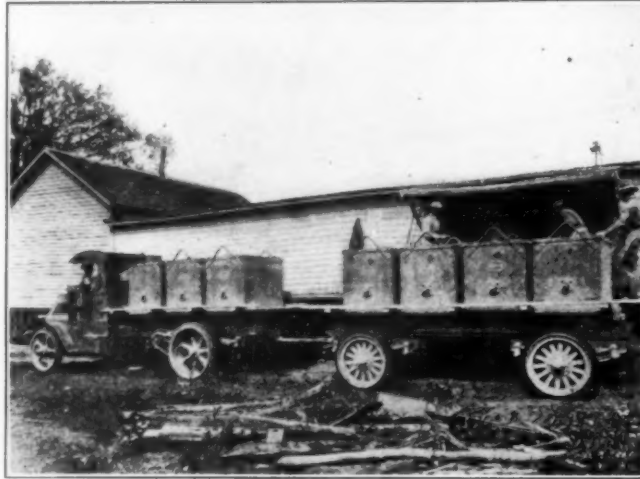
The big pipe shown in the upper photograph claims the distinction of being the longest single piece of machinery in the world. It is a cement kiln at the new plant of the Trinity Portland Cement Company at Ft. Worth, Tex., and is 200 ft. in length. © P & A Photos.
The lower photograph shows an unusual type of dredge in use in Rotterdam harbor. The material is discharged through openings in a big cylinder. © Keystone.

COMBINATION HAUL KEEPS MIXER BUSY

Trucks and Narrow Gage Cars Solve Supply Problem on Ohio Road Job

A THOROUGH survey of the conditions confronting them on a 15-mi. road job between Niles and Ashtabula, Ohio, resulted in the adoption by the contractors, Hill & Hill of Elyria, Ohio, of the combination haul system of supplying the paver. Trucks were used to carry the aggregates over the finished concrete to the nearest possible point to the paver, and then the batch boxes were transferred to narrow-gage cars and hauled over industrial track the remainder of the distance. At the beginning of the work, as will be described later, materials were hauled by truck over intersecting roads and then transferred to the narrow-gage cars.

About three miles of the road to be paved consisted

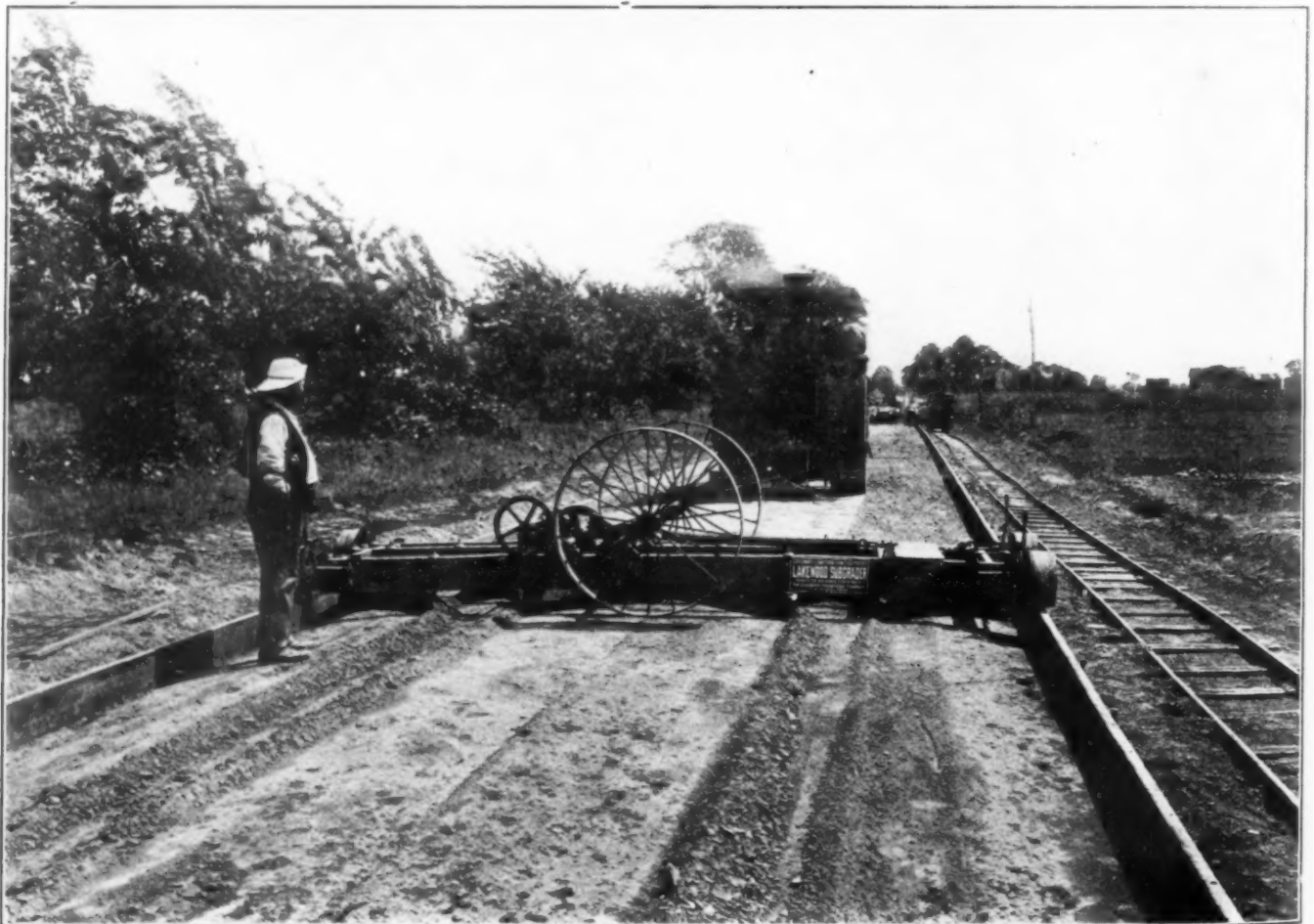


TRUCK AND TRAILER AT CEMENT SHED

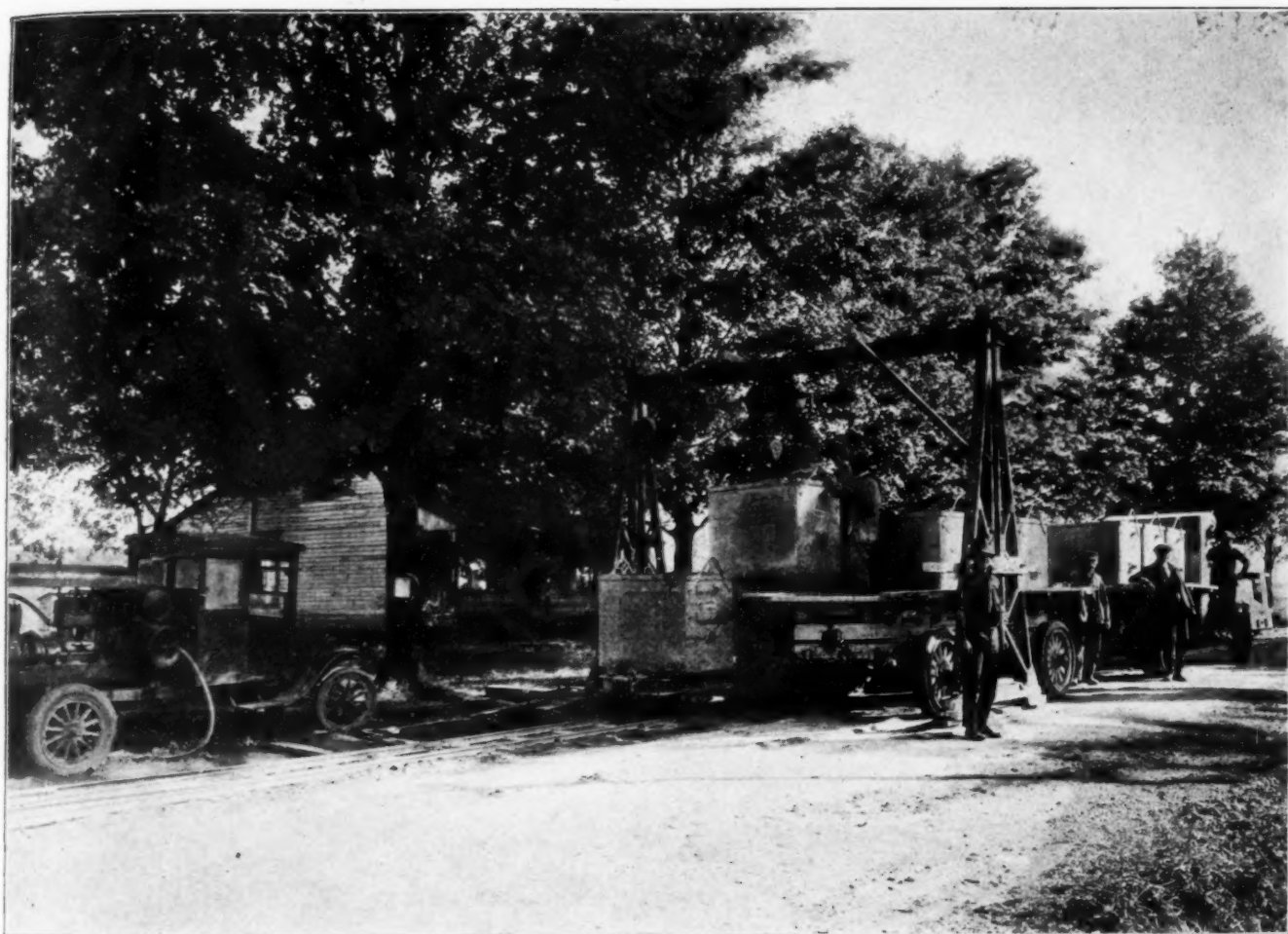
of old macadam in very bad condition. The rest was of clay with some gravel mixed into it. The whole road after the winter season was in bad shape and the possibilities of hauling over it at the beginning of the season were nil. The railroad paralleled the road about 4 mi. away. After careful consideration of all types of hauling and considering the impossibility of truck haulage at the beginning of the season, and the delays that were sure to come with

every fall of rain if trucks were used to haul over the subgrade, the contractors decided to use the combination of trucks and narrow gage.

The general plan was as follows: The first proportioning yard was set up at East Orwell. From there a road led straight to the road to be constructed $4\frac{1}{2}$



AT WORK ON THE SUBGRADE



THE TRANSFER POINT WHERE BATCH BOXES WERE UNLOADED FROM TRUCKS AND PLACED ON NARROW GAGE CARS

mi. distant. The beginning of the work was $2\frac{1}{2}$ mi. south of this intersecting point. These 2 mi. and the 2 mi. north of this point were built from narrow gage track. The trucks with trailers attached hauled properly proportioned batches in batch boxes from the proportioning yard to the railway. These batches were then transferred from trucks to narrow gage cars and hauled to the mixer.

When the 2 mi. north of the intersecting point were finished a portion of the pavement was cured enough to allow the trucks to haul over it. The narrow gage track along this portion was moved up ahead and the transfer plant also moved. Thereafter each day the track and transfer point were moved until $3\frac{1}{2}$ mi. of road were built north from the intersecting point of the road under construction with the road from East Orwell.

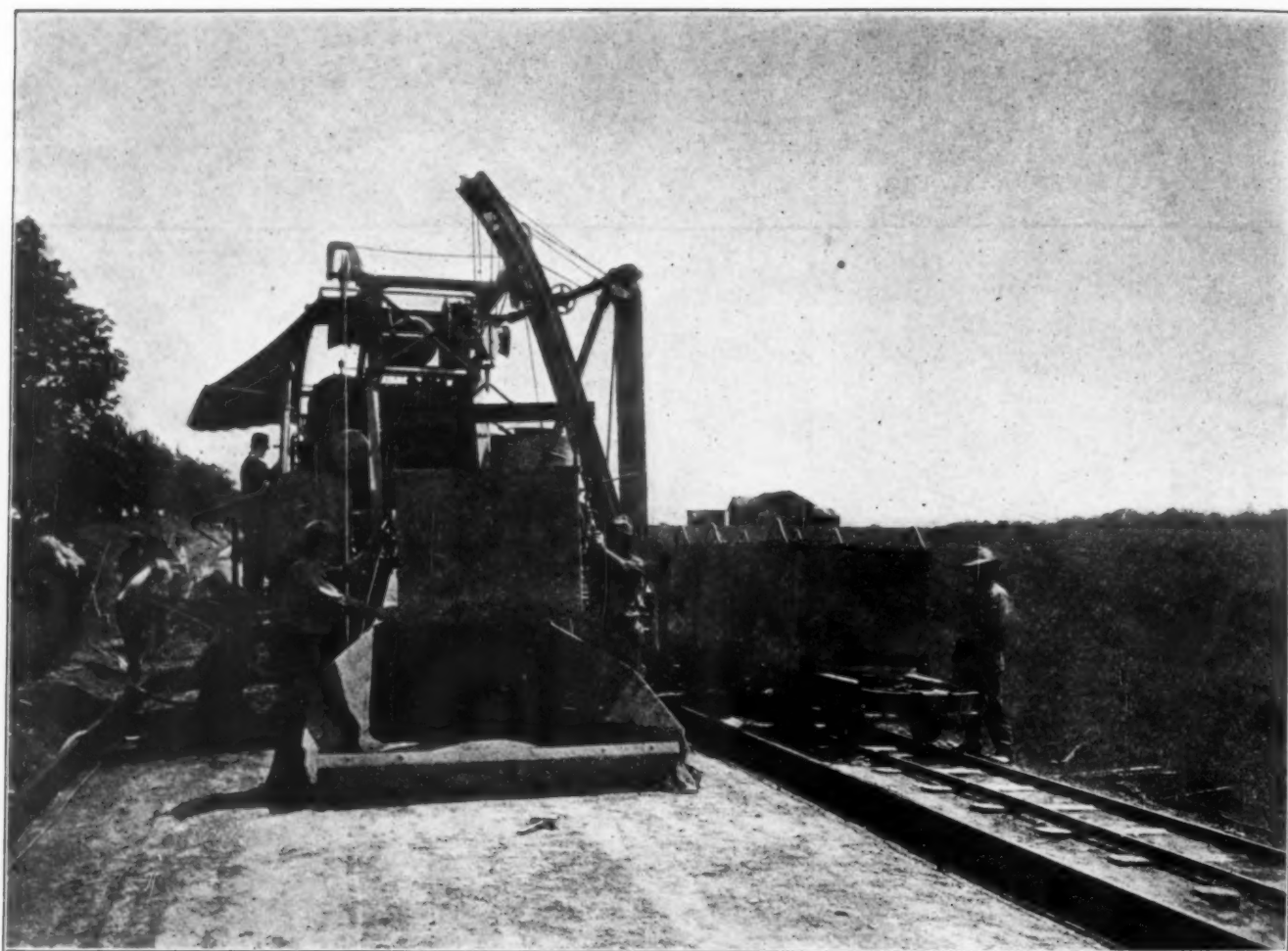
Then the proportioning yard was shifted to Rome. The road from Rome was $3\frac{1}{2}$ mi. from its point of intersection with the road under construction. The 2 mi. to be built from this point to the end of the piece built from East Orwell were constructed from industrial track. The 4 mi. north of the point of intersection of the road from Rome with the road to be constructed, were constructed as described above, the track and transfer point being moved each day as additional pavement was in shape to support the trucks.

The loading plant was moved again, this time to Jefferson. The end of the job was $2\frac{1}{2}$ mi. from this point. The $3\frac{1}{2}$ mi. remaining were constructed from here as described above.

The truck hauling was let to a trucking contractor at a fixed price per batch-box mile. He placed on the job six 5-ton trucks and six 8-ton trailers. The trucks carried three batch boxes and the trailers, four. Each batch box contained a 6-bag batch of $1\frac{1}{2}$ -3 mix. This outfit supplied the mixers to capacity (about 40 batches per hour) easily, at the average haul of 4.35 mi.

On the maximum haul of 6 mi. they were pushed to the limit and another truck and trailer were really needed, but inasmuch as this maximum of 6 mi. lasted for only a short time, the extra outfit was not used. On the 6-mi. haul the outfits made seven round trips per 10-hr. day. Allowing the $7\frac{1}{2}$ min. to load and $7\frac{1}{2}$ min. to transfer the batch boxes, the trucks traveled about an average of 10 mi. per hour.

The average haul on the narrow gage track was $1\frac{1}{2}$ mi., the maximum haul, 2 mi. The equipment was split into three trains of seven to nine cars each. The locomotives were left attached to the train at the mixer, shifting cars there. At the transfer point the locomotives switched to the extra train. This outfit could at all times easily supply the mixer to capacity. By the liberal use of sand the locomotives were able



FEEDING THE PAVER

to haul nine-car trains over 5 and 5.9 per cent grades.

The general method of operation was as follows: The seven batch boxes on truck and trailer were loaded at the proportioning yard with stone and sand from an overhead bin of about 100 tons capacity, which was kept loaded by a gasoline crane. The placing of cement was from cars or the cement shed. This work was let to one man at so much a sack and he with four helpers took care of the work. Four men with the crane operator and a foreman handled the stone and sand. It took an average of $7\frac{1}{2}$ min. to load seven batch boxes.

The batch boxes were then hauled to a transfer point at the beginning of the narrow gage track and transferred from the trucks to the industrial road cars.

The transfer equipment, designed by the contractors, consisted of a 2-ton air hoist, mounted on an 8-in. steel I beam, supported by two A frames on each side of the road. An air compressor mounted on a small motor truck supplied the air for its operation. The transfer was moved on two 6 x 6 timbers placed on top of the batch boxes on one of the trucks. It generally took $1\frac{1}{2}$ hr. to move.

From the transfer point the batches were hauled to the mixer over the narrow gage track and transferred from the cars to the skip of the mixer by a small der-

rick mounted on the mixer. The weight of the descending skip furnished the necessary power.

At the transfer point four men and a foreman were used. Two men comprised the train crew. An average of 600 ft. of track had to be taken up and relaid each day. Six men and a foreman did this work and maintained the track. At the mixer three men were required to shift the boxes from cars to skip and back to cars.

The contractors completed this job in 185 days, on 135 of which concreting was done.

Fifteen days were lost on account of rain, seven days were lost moving material proportioning yard and 1 day was lost on account of no material. On 26 Sundays and the Fourth of July the outfit did not work.

The average run for the 135 days that the mixer was started was 586 ft. The maximum run was 903 ft. in 11 hours. The best run was 878 ft. in 10 hr.

At one time the contractors were 9000 ft. behind their schedule, but they finished a week ahead of it. They estimated they could not have worked 50 per cent of the time with any other method of hauling.

This job was designated as the Niles-Ashtabula I.C.N. 150 Sections, M, N, O, P, Q and R. The pavement is 16 ft. in width, 7 in. thick in the center and 9 in. at the edges, the average thickness being $7\frac{1}{4}$ in. The mix was of $1:1\frac{1}{2}:3$ proportion.